REMARKS/ARGUMENTS

Claims 1-35 remain in the application.

Claims 1, 4, 12, 19 and 30 are amended.

Claims 7, 9-11, 13, 18 and 26 are currently cancelled.

Claims 36-41 are newly presented.

Information Disclosure Statement

The Examiner is thanked for acknowledging and reviewing the Information Disclosure Statement previously filed.

Claim Objections

Claim 30 was objected to because of perceived informalities. Claim 30 is amended herein, whereby the objection is believed to be overcome.

Claim Rejections Under 35 USC § 102

Claims 1-11, 13-16, 20-23, 28-30 and 32-35 were rejected under 35 USC §102(b) over US Patent 5,745,054 to Wilkens, et al.

The invention as currently recited in claim 1 is believed to be patentable over Wilkens, which teaches an aircraft display system that positions a synthetic runway on a display in alignment with a target runway. The system of Wilkens computes a lateral deviation rate of the host aircraft relative to an extended centerline of a target runway. Wilkens also teaches computing a ground track of the aircraft, and a track error angle representative of a difference between the extended centerline of the runway and the ground track of the aircraft. Runway bearing relative to ground track is computed from the track error angle and lateral deviation angle. See, e.g., Abstract.

The present invention, as recited in amended claim 1, is an airport lighting aid simulation generator that includes means for determining deviation from a glide path; means for outputting a signal representative of the deviation from the glide path; and a means for outputting a signal representative of a visual image for displaying the deviation as a pattern of color coded indicators.

Wilkens does not clearly anticipate the invention recited in claim 1 as currently amended. Wilkens does not appear to teach the means for outputting a signal representative of a visual

image for displaying the deviation from the glide path. Rather, Wilkens teaches display of "runway bearing." See, e.g., Wilkens at column 6, lines 19-26, reproduced herein below:

> Symbol generator 61 generates the symbology commands which control what is displayed by display 60. Symbol generator 61 interfaces with various aircraft systems to receive the necessary data to compute runway bearing according to the invention. Computations are performed by a digital microprocessor or CPU 61A which is included in symbol generator 61. Wilkens at column 6, lines 19-26.

Thus, Wilkens teaches a symbol generator 61 that generates what is displayed by display 60. But Wilkens teaches that symbol generator 61 generates "runway bearing according to the invention." As taught by Wilkens, "runway bearing" is a lateral deviation from the runway extended centerline 31A as a function lateral deviation angle, aircraft ground speed, and drift angle, as shown by the following.

> FIG. 4 is a top view of a runway illustrating the computation of runway bearing. Shown in FIG. 4 are runway 31, the extended centerline 31A, aircraft position 32, lateral deviation Y, aircraft ground track, track error angle, localizer deviation angle (i.e. lateral deviation angle), and runway bearing relative to ground track (RBRGT). Wilkens at column 4, lines 37-42.
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> Runway bearing is a key value for positioning a synthetic runway on a display. The data used to compute runway bearing include lateral deviation angle, aircraft ground speed, and drift angle. Once this data is available, runway bearing is computed as follows:
>
> Y=X * tan(lat. dev. angle)
>
> Y=X * d(tan (lat. dev. angle))/dt
>
> Track error angle=arcsin(Y/ground speed)
>
> RBRGT=track error angle-lat. dev. angle
>
> RBRAH=RBRGT-drift angle
>
> where:
>
> RBRGT is Runway Bearing Relative to Ground Track and
>
> RBRAH is Runway Bearing Relative to Aircraft Heading

> All three inputs (i.e. lateral deviation angle, ground speed, and drift angle) may be derived from a variety of aircraft systems. The preferred embodiment uses an ILS system to provide localizer deviation which is used for the lateral deviation angle. Ground speed is provided by either a GPS based system or an inertial reference system (IRS). Alternatively, airspeed data, such as from an air data computer, may be used as an approximation of ground speed.
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> Drift angle is computed as magnetic heading minus magnetic ground track. Those skilled in the art understand that drift angle may be computed in numerous ways using data from various aircraft systems. Wilkens at column 4, line 43-column 5, line 7.

See, also, Figure 4 wherein Wilkens shows "runway bearing" being a lateral measure.

Thus, as taught by Wilkens, the "runway bearing" computed by the symbol generator 61 for display by the display 60 is clearly a lateral deviation, rather than a glide path, as recited in claim 1 for the present invention.

Wilkens does not appear to anticipate the means for outputting a signal representative of a visual image for displaying the deviation from the glide path, as presently recited in claim 1, at least because Wilkens teaches that symbol generator 61 generates what is displayed by display 60, and the examiner has failed to show that the symbol generator 61 of Wilkens generates any signal other than the "runway bearing."

For at least the above reasons, claim 1 as presently amended is patentable over Wilkens.

Claim 7 is cancelled, whereby the rejection as to claim 7 is made moot.

Claims 2-6 are allowable at least as depending from now allowable claim 1.

Claim 2 is additionally allowable independently of allowable base claim 1 as reciting "a means for visually displaying the deviation from the glide path as a function of the deviation signal." In contrast, Wilkens does not appear to teach such means for visually displaying the deviation from the glide path at least because Wilkens teaches display 60 that displays "runway bearing according to the invention." See, Wilkens at column 6, lines 19-26, which is reproduce herein above.

Thus, Wilkens does not appear to teach the display "for visually displaying the deviation from the glide path as a function of the deviation signal," as originally recited in claim 2.

For at least the above reasons, claim 2 is additionally allowable independently of claim 1.

Claim 3 is additionally allowable independently of allowable base claim 1 as reciting "a means for displaying the deviation as a pattern of color coded indicators." As discussed herein above, Wilkens does not appear to teach display means for indicating deviation from glide slope. Rather, Wilkens appears to teach use of glide slope only as an input to a computation of distance to runway. See, e.g., Wilkens at column 4, lines 8-12, and claim 11.

Furthermore, Wilkens does not appear to teach displaying any information as a "pattern of color coded indicators," as recited in amended claim 3. Rather, Wilkens appears to teach the display 60 as including an overhead unit portion 60A, a brightness control 60B, and a combiner or display screen 60C. Overhead unit 60A receives symbology commands from symbol generator 61 and converts these symbology commands to graphic symbols for display on combiner 60C. Wilkens at column 6, lines 9-19, reproduced herein below:

> Display 60 is illustrated as a head up display having an overhead unit portion 60A, a brightness control 60B, and a combiner 60C (also generically referred to as a display screen). Overhead unit 60A receives symbology commands from symbol generator 61. The symbology commands are converted into graphic symbols which are projected onto combiner 60C. Combiner 60C is positioned between the pilot 63 and the windshield of the aircraft so that the pilot can simultaneously view both the synthetic runway symbology and the outside world. Wilkens at column 6, lines 9-19.

Thus, Wilkens teaches a means for visually displaying information. However, Wilkens does not appear to anticipate displaying the deviation as a pattern of color coded indicators, as originally recited in claim 3. Rather, Wilkens teaches that "symbology commands are converted into graphic symbols," and that the graphic commands are "projected onto combiner 60C." See, Wilkens at column 6, lines 9-19, which is reproduced herein above.

Thus, the examiner has failed to show that Wilkens teaches <u>how</u> to display images on combiner 60C. More specifically, the examiner has failed to show that Wilkens teaches "a means for displaying the deviation as a pattern of color coded indicators," as recited in claim 3.

For at least these additional reasons, claim 3 is patentable over Wilkens at least because Wilkens does not appear to anticipate the means for displaying the deviation as a pattern of color coded indicators.

Thus, claim 3 is additionally allowable independently of allowable base claim 1.

Claim 4 is additionally allowable independently of allowable base claim 1 as reciting "means for displaying information as to a degree of deviation from the glide path as a visual image relative to the pattern of color coded indicators." In contrast, Wilkens appears to teach using angular deviation of the aircraft from the glide slope for computing the actual glide path angle of the aircraft. See, e.g., Wilkens at column 4, lines 24-32, reproduced below:

> Glide path angle is derived from the on board ILS system and runway specific glide path data provide by either an on board data base or the pilot. The ILS system provides deviation data representative of the angular deviation of the aircraft from the glide slope signal. The on board data base provides the angle of the glide slope angle of the specific approach being used. Adding the deviation angle and the glide slope angle yields the actual glide path angle of the aircraft. Wilkens at column 4, lines 24-32.

Thus, Wilkens does not appear to teach means for determining a degree of deviation from the glide path, and furthermore does not appear to teach the means for displaying the degree of deviation. Furthermore, Wilkens does not appear to anticipate displaying information as to a degree of deviation from the glide path as a visual image relative to the pattern of color coded indicators, as recited in amended claim 4.

At least because the examiner has failed to show that Wilkens teaches means for displaying information as to a degree of deviation from the glide path, nor for displaying the information as a visual image relative to the pattern of color coded indicators, claim 4 is additionally allowable independently of allowable base claim 1.

Independent claims 8, 14, 20 and 28 all differ in scope from allowable claim 1. However, the above arguments directed to claim 1 are sufficiently applicable to claims 8, 14, 20 and 28 as to make repetition unnecessary. Thus, for each of the reasons above, all of claims 8, 14, 20 and 28 are believed to be allowable over the cited art.

Claims 9-11 and 13 are cancelled, where by the rejections as to these claims are made moot.

Claims 15 and 16 are allowable at least as depending from allowable independent claim 8.

Claims 21-23 are allowable at least as depending from allowable independent claim 20.

Claim 23 is additionally allowable independently of claim 20 as reciting "sixth computer-readable program code means for interpreting the signal output by the fifth computer-readable program code means as a pattern of color coded indicators on a cockpit display." Claim 23 differs in scope from allowable claim 3. However, the above arguments directed to claim 3 are sufficiently applicable to claim 23 as to make repetition unnecessary. Thus, for each of the reasons above, claim 23 is believed to be allowable independently of allowable base claim 20.

Claims 29, 30 and 32-35 are allowable at least as depending from allowable independent claim 28.

Claim Rejections Under 35 USC § 103

Claims 12, 17-19, 24-27 and 31 were rejected under 35 USC § 103(a) over US Patent 5,745,054 to Wilkens, et al. in view of US Patent 4,210,930 to Henry.

The invention as originally presented is patentable over both Wilkens and Henry, individually and in combination.

As discussed above, Wilkens does not appear to disclose or suggest display of an artificial glide slope or deviation from an ideal glide slope. Furthermore, Wilkens does not appear to teach that "the illuminated indicators are positioned on the display to appear in positions consistent with ground-based airport lighting aids as seen on approach," as originally recited in claim 12.

Henry teaches microwave energy sources which are made to appear as runway lights according to a simulated display on a CRT or image scan within the cockpit of the aircraft. Henry teaches replacing the visible light generated by the runway lights with a microwave counterpart of such image within the cockpit. Henry teaches an on-board camera 38 which is aimed to receive radio signals from a transponder DME beacon 12 located at the threshold 14 of the runway 16 for measuring a distance between the aircraft and runway. The distance measurement positions a CRT screen 48 and determines the size of the display. Henry at column 3, lines 21-50, reproduced in part herein below:

> The multiple microwave emissions developed from the separate emitter-reflector combinations and corresponding to each runway light are passed through a pinhole 46 of the camera 38 and projected onto a screen 48. The screen 48 is movable from the "X" position to the "Y" position (FIG. 10) by an actuator 50 which moves responsively to a transponder DME beacon 12 located at the threshold 14 of the runway 16. The transponder beacon 12, upon receiving a designated signal from the aircraft in the form of a coded series of pulses, emits a radio signal of its own that is also codeable. In this manner, there is provided a distance measuring between the aircraft and runway which in turn positions the screen 48 and determines the size of the display produced by the CRT on the aircraft. Image size is thus related to distance. Henry at column 3, lines 35-50.
>
> **The signal received from the transponder continuously controls the distance X . . . Y and, hence, the image size produced on the screen or focal plane 48.** Henry at column 3, lines 51-53.

Henry is an improper reference and clearly cannot be combined with Wilkens. Henry teaches using physical radio frequency measurements of distance to ground-based transponders to locate images on cockpit CRT screen 48. Henry at column 3, lines 35-53, reproduced herein above.

Wilkens teaches an aircraft display system that positions a synthetic runway on an overhead unit 60A according to symbology commands received from symbol generator 61 and converted into graphic symbols which are projected onto a combiner or cockpit display screen 60C. The symbology commands that control what is displayed by display 60 are generated by the symbol generator 61 which interfaces with various aircraft systems to receive the necessary data to compute runway bearing according to the invention. Computations are performed by a digital microprocessor or CPU 61A which is included in symbol generator 61. See, e.g., Wilkens at column 6, lines 9-26.

Thus, Henry and Wilkens are <u>completely different</u> in design and operation because Henry teaches a cockpit CRT screen 48 that is controlled by signals from ground-based transponder DME beacon 12, but Wilkens teaches controlling the display 60 by an on-board digital microprocessor or CPU 61A that computes the control commands using data retrieved from on-board aircraft

systems. The two systems taught by Wilkens and Henry are thus so different in operation and design that modification of Wilkens by Henry would change the principle of operation of the Wilkens device because the suggested combination of references would require a substantial reconstruction and redesign of the elements shown in Wilkens, as well as a change in the basic principle under which Wilkens construction was designed to operate. Thus, because the proposed modification of the Wilkens reference would change the principle of operation of the Wilkens device, the teachings of the references are not sufficient to render the claim obvious. See, *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) as reported in MPEP 2143.01..

Furthermore, there is no reasonable expectation of success in combining these references because Wilkens and Henry are so different in operation and design that modification of the on-board microprocessor generation of display commands using on-board aircraft system data as taught by Wilkens by combination with the ground-based transponder controlled display of Henry would be unworkable and provide no reasonable expectation of success, as required by the court of *In re Merck & Co., Inc.* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986); and *Ex parte Blanc*, 13 USPQ2d 1383 (Bd. Pat. App. & Inter. 1989) as reported in MPEP 2143.02.

Furthermore, even if Henry could be combined with Wilkens, which it cannot, Henry fails to provide the deficiencies of Wilkens.

Claim 12 depends from allowable base claim 8. As discussed above, Wilkens does not appear to disclose or suggest the means for displaying a "visual indication of the degree of coincidence with the glide path," as originally recited in claim 8. Rather, Wilkens teaches display of "runway bearing." See, e.g., Wilkens at column 6, lines 19-26.

Henry also fails to disclose or suggest the "visual indication of the degree of coincidence with the glide path," as originally recited in claim 8. Rather, Henry only teaches replacing the visible light generated by the runway lights with a microwave counterpart of such image as a simulated display on a CRT or image scan within the cockpit of the aircraft. See, e.g., Henry at column 3, lines 21-53 (reproduced herein above). The simulated display as taught by Henry is not "a visual indication of the degree of coincidence with the glide path," as recited in claim 8.

Rather, Henry teaches that the "microwaves are reflected and made to appear as circular and bar lights when the microwaves emitted from the paraboloid reflector antennae are displayed onto the CRT as circular and bar lights respectively," as counterpart to the VASI lights that emit

visible light. Henry at column 7, lines 2-10. These microwave counterparts of the visible light emitted by the VASI lights *must be monitored by the pilot* to detect deviation from the glide path "the same as would be the case if the visible lights from the VASI were available for direct view." Henry at column 7, line 63-column 8, line 4. Thus, in contrast to the signal generator causing the display to "output a visual indication of the degree of coincidence with the glide path," as recited in claim 1, Henry teaches that it is the ***pilot*** that monitors the microwave counterparts on the display and then independently detects any deviation from the glide path. Therefore, Henry fails to disclose or suggest a display structured to "output a visual indication of the degree of coincidence with the glide path," as recited in claim 8.

For at least the above reasons, claim 8 is believed to be allowable. Claim 12 is allowable at least as depending from allowable claim 8.

Independent claims 14, 20 and 28 all differ in scope from allowable claim 1. However, the above arguments directed to claim 1 are sufficiently applicable to claims 8, 14, 20 and 28 as to make repetition unnecessary. Thus, for each of the reasons above, all of claims 8, 14, 20 and 28 are believed to be allowable over the cited art.

Claims 18 and 26 are cancelled, whereby the rejections as to these claims are made moot.

Claims 17-19, 24-27 and 31 depending respectively from independent claims 14, 20 and 28 are allowable at least as depending from allowable independent claims.

Newly Presented Claims

Newly presented claim 36 is allowable at least as depending from allowable base claim 29 and intervening dependent claim 31.

Newly presented claim 36 is further allowable as further limiting the method of displaying color coded information as to a degree of deviation, as recited in claim 31, to displaying an illuminated indicator indicating the degree of deviation from the glide path positioned relative to a pattern of illuminated indicators simulating a known airport lighting aid.

As discussed herein above, Wilkens teaches the display 60 displaying a "runway bearing." See, Wilkens at column 6, lines 19-26, which is reproduce herein above. Thus, as discussed above relative to claim 4, Wilkens does not appear to teach displaying an illuminated indicator indicating the degree of deviation, as recited in claim 36.

Furthermore, as discussed, Henry only teaches replacing the visible light generated by the runway lights with a microwave counterpart of such image as a simulated display on a CRT or image scan. See, e.g., Henry at column 3, lines 21-53 (reproduced herein above). Thus, Henry fails to provide any deficiencies of Wilkens as to displaying an illuminated indicator indicating the degree of deviation from the glide path positioned relative to a pattern of illuminated indicators simulating a known airport lighting aid, as recited in newly presented claim 36.

For each of the reasons above, claim 36 is believed to be allowable independently of allowable base claim 28 and intervening dependent claim 31.

Newly presented claims 37-41 are allowable as depending from allowable base claim 8.

Each of newly presented claims 37-41 are believed to be further allowable as further limiting the generator of claim 8.

Newly presented claim 37 is further allowable as further limiting the display of claim 8. Wilkens does not appear to disclose or suggest "illuminated degree of deviation indicator indicating a degree of deviation from coincidence with the glide path, the illuminated degree of deviation indicator being positioned relative to the pattern of illuminated indicators simulating a known airport lighting aid," as recited in new claim 37. Rather, as discussed above, Wilkens teaches the display 60 displaying a "runway bearing." See, Wilkens at column 6, lines 19-26, which is reproduce herein above.

Henry, as discussed above, only teaches replacing the visible light generated by the runway lights with a microwave counterpart of such image as a simulated display on a CRT or image scan. See, e.g., Henry at column 3, lines 21-53, which is reproduce herein above. Thus, Henry fails to provide any deficiencies of Wilkens as to "an illuminated degree of deviation indicator indicating a degree of deviation from coincidence with the glide path, the illuminated degree of deviation indicator being positioned relative to the pattern of illuminated indicators simulating a known airport lighting aid," as recited in new claim 37.

Newly presented claims 38-41 all differ in scope from allowable claim 37. However, the above arguments directed to claim 37 are sufficiently applicable to claims 38-41 as to make repetition unnecessary. Thus, for each of the reasons above, all of claims 38-41 are believed to be allowable over the cited art.

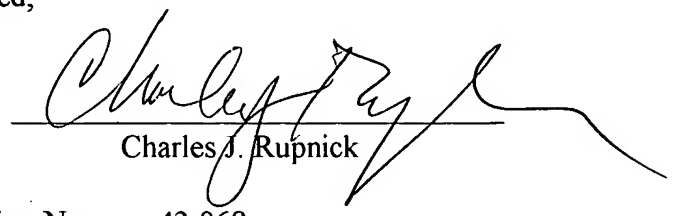
Claim Fees

Seven claims (7, 9-11, 13, 18 and 26) are currently cancelled. Six claims (36-41) are newly presented. Therefore, the applicant believes that no extra claim fee is due.

The claims now being in form for allowance, reconsideration and allowance is respectfully requested.

If the Examiner has questions or wishes to discuss any aspect of the case, the Examiner is encouraged to contact the undersigned at the telephone number given below.

Respectfully submitted,



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